## **Claims**

- [c1] What is claimed is:
  - 1. A method of optimizing idle speed for a fuel injected engine comprising the steps of: determining instantaneous current requirements of electronics of a watercraft; from the instantaneous current requirements, determining a minimum engine speed necessary to drive a battery

charging device of the watercraft; and adjusting, on-the-fly, idle speed of the fuel injected engine to the minimum engine speed.

- [c2] 2. The method of claim 1 wherein the step of determining instantaneous current requirements of electronics of the watercraft at idle further includes the step of acquiring current feedback data from a plurality of current sensors operationally connected to the electronics.
- [c3] 3. The method of claim 1 further comprising the step of determining a charge level of a battery of the watercraft.
- [c4] 4. The method of claim 3 wherein the step of determining a minimum engine speed includes the step of isolating an engine speed sufficient to drive the battery charg-

ing device to charge the battery given the instantaneous current requirements of the electronics and the battery charge level.

- [c5] 5. The method of claim 4 further comprising the step of comparing the instantaneous current requirements of the electronics and charging output of the battery charging device with a predetermined map of data to determine the minimum engine speed.
- [c6] 6. The method of claim 1 further comprising the step of adjusting the idle speed to a level sufficient to drive the battery charging device such that a charge level of a battery of the watercraft remains above a predetermined charge level.
- [c7] 7. The method of claim 1 wherein the electronics include at least one of an ECU, lights, live well aerators, pumps, fuel injectors, and alternator.
- [08] 8. An outboard motor comprising:
  an internal combustion engine;
  an alternator driven by the engine and connected to
  charge a battery;
  an idle speed controller connected to the engine and
  configured to adaptively set an idle speed of the engine;
  and

an ECU to instruct the idle speed controller to set an idle speed of the engine based on instantaneous power requirements on the battery.

- [09] 9. The outboard motor of claim 8 further comprising a plurality of current sensors connected to provide feedback to the ECU of instantaneous current requirements of a plurality of auxiliary devices.
- [c10] 10. The outboard motor of claim 8 wherein the ECU further includes memory having stored therein a predefined curve representing alternator output versus idle engine speed data.
- [c11] 11. The outboard motor of claim 10 wherein the ECU is further configured to determine idle speed from the predefined curve based on the instantaneous power requirements.
- [c12] 12. The outboard motor of claim 8 wherein the ECU is further configured to determine idle speed to prevent voltage of the battery from falling below a predetermined level.
- [c13] 13. The outboard motor of claim 8 wherein the ECU is further configured to determine an idle speed for warm-up conditions of the engine that is independent of the instantaneous power requirements.

- [c14] 14. The outboard motor of claim 8 wherein the ECU is further configured to instruct the idle speed control to set the idle speed of the engine to a level minimally sufficient to run the engine and satisfy the instantaneous power requirements.
- [c15] 15. The outboard motor of claim 8 wherein the internal combustion engine has at least one fuel injector in direct communication with a cylinder of the internal combustion engine.
- [c16] 16. A computer readable storage medium having stored thereon a computer program to adaptively regulate engine idle speed, the computer program having a set of instructions that when executed by a processor cause the processor to:

determine an instantaneous battery voltage level of a battery configured to supply power to an engine; determine instantaneous power requirements of the engine; and

based on the instantaneous battery voltage level and the instantaneous power requirements, determine an engine idle speed.

[c17] 17. The computer readable storage medium of claim 15 wherein the set of instructions further causes the pro-

cessor to determine the engine idle speed from a map of predefined values stored in a memory accessible by the computer.

- [c18] 18. The computer readable storage medium of claim 15 wherein the set of instructions further causes the processor to set engine idle speed to a level sufficient to drive a battery charging device such that the instantaneous battery voltage remains above a predetermined level.
- [c19] 19. The computer readable storage medium of claim 15 wherein the set of instructions further causes the processor to set idle speed to a speed lower than that needed when the battery is not fully charged and the instantaneous power requirements of the engine is below a predetermined level.
- [c20] 20. The computer readable storage medium of claim 18 wherein the set of instructions further causes the processor to set the idle speed to below 500 RPM.
- [c21] 21. The computer readable storage medium of claim 15 incorporated in an ECU of an outboard motor having a direct injected engine.